

## CLAIMS

- 1    1.    A heat collector for a cooling system of an electronic display, comprising:  
2        a heat sink in conjunction with a display screen of the electronic display; and  
3        a liquid phase line and a gas phase line fluidly connected to each other and  
4        thermally connected to the heat sink.
- 1    2.    The heat collector of claim 1, wherein:  
2        the heat sink has a channel receiving at least a portion of the gas phase line.
- 1    3.    The heat collector of claim 2, wherein the channel is serpentine and the gas phase  
2        line is serpentine and fits into the channel.
- 1    4.    The heat collector of claim 2, further comprising a thermally conductive material  
2        between the portion of the gas phase line and the heat sink to improve conductive  
3        heat transfer.
- 1    5.    The heat collector of claim 2, wherein the liquid phase line extends coincidently  
2        with the portion of the gas phase line.
- 1    6.    The heat collector of claim 5, wherein the liquid phase line is disposed inside the  
2        gas phase line.
- 1    7.    The heat collector of claim 5, wherein the liquid phase line is integral with the gas  
2        phase line.
- 1    8.    The heat collector of claim 1, wherein the gas phase line is at least partially  
2        formed by a portion of the heat sink.

- 1 9. The heat collector of claim 8, wherein the liquid phase line is at least partially  
2 formed by a portion of the heat sink.
- 1 10. The heat collector of claim 1, further comprising:  
2 a heat sink cover plate mounted to the heat sink with at least a portion of the gas  
3 phase line between the heat sink cover plate and the heat sink.
- 1 11. The heat collector of claim 1, further comprising through holes in the heat sink for  
2 receiving fasteners therethrough.
- 1 12. The heat collector of claim 1, wherein the heat sink has an opening for inlet and  
2 outlet, the opening receiving both the gas phase line and the liquid phase line  
3 therethrough.
- 1 13. The heat collector of claim 12, further comprising:  
2 a manifold with an input connection for receiving the liquid phase line and an  
3 output connection for receiving the gas phase line; and  
4 the manifold having a combination output and input connection fluidly connected  
5 to the opening for inlet and outlet of the heat sink;  
6 wherein the manifold combines the gas phase line and the liquid phase line into a  
7 composite line comprising at least a portion of the gas phase line and a portion of the  
8 liquid phase line.
- 1 14. The heat collector of claim 13, wherein the manifold is integral with the heat sink
- 1 15. The heat collector of claim 13, wherein the manifold is added to the heat sink.

- 1 16. A heat collector, comprising:  
2 a heat sink including a mass of heat conductive material; and  
3 a recess in the mass of material;  
4 at least a gas phase line in the recess;
- 1 17. The heat collector of claim 16, further comprising:  
2 a liquid phase line in the recess.
- 1 18. A heat collector of claim 17, wherein the liquid phase line is disposed inside the  
2 gas phase line.
- 1 19. A heat collector of claim 18, wherein a downstream end of the liquid phase line is  
2 fluidly connected to and forms a transition into the gas phase line.
- 1 20. A heat collector of claim 19, wherein the transition is adjacent to an upstream end  
2 of the gas phase line.
- 1 21. The heat collector of claim 17, wherein the liquid phase line is at least partially  
2 coextensive with the gas phase line.
- 1 22. The heat collector of claim 17, wherein the liquid phase line extends along a  
2 substantial portion of the gas phase line.
- 1 23. The heat collector of claim 16, wherein:  
2 the recess is a longitudinal recess; and  
3 a first end of the recess comprises an opening in the heat sink,  
4 the opening being an inlet and outlet opening.
- 1 24. The heat collector of claim 23, wherein a second end of the recess comprises a  
2 closed end within the mass of heat conductive material.

1 25. The heat collector of claim 24, further comprising a liquid phase line in the recess  
2 extending substantially to the closed end of the recess;  
3 wherein the closed end of the recess forms a transition between the liquid phase  
4 line and the gas phase line.

1 26. The heat collector of claim 16, further comprising a composite line including a  
2 plurality of lines including said gas phase line.

1 27. The heat collector of claim 26, wherein the composite line is received in the  
2 recess.

1 28. The heat collector of claim 26, further comprising:  
2 a manifold for uniting a separate gas phase line and a separate liquid phase line  
3 into the composite line; and  
4 the manifold having a combined gas phase and liquid phase connection fluidly  
5 connected to the composite line.

1 29. The heat collector of claim 28, wherein the manifold has an upstream liquid phase  
2 input connection and a downstream gas phase output connection separate from the  
3 liquid phase inlet connection.

1 30. A plurality of liquid phase and gas phase lines for a cooling system, comprising:  
2 an internal gas phase line;  
3 an external gas phase line connected to the internal gas phase line; and  
4 an external liquid phase line;  
5 wherein the external liquid phase line and the external gas phase line have  
6 substantially the same diameter.

1 31. The plurality of liquid phase and gas phase lines in claim 30, further comprising  
2 an internal liquid phase line.

1    32.    The plurality of liquid phase and gas phase lines in claim 2, wherein the internal  
2           liquid phase line is disposed inside and extends along a major portion of the  
3           internal gas phase line.

1    33.    The plurality of liquid phase and gas phase lines in claim 31, further comprising:  
2           a manifold;  
3           the manifold having: a liquid phase input connection fluidly connected to the  
4           external liquid phase line, a gas phase output connection fluidly connected to the external  
5           gas phase line; and  
6           a combined gas phase and liquid phase connection fluidly connected to the  
7           internal gas phase line and the internal liquid phase line.

1    34.    The plurality of liquid phase and gas phase lines in claim 31, wherein the internal  
2           gas phase line and the internal liquid phase line form a composite internal line.

1    35.    The plurality of liquid phase and gas phase lines in claim 34, wherein the  
2           composite internal line has a first end fluidly connected to a manifold and a  
3           second end fluidly connecting the internal liquid phase line to the internal gas  
4           phase line and forming a transition therebetween.

1    36.    The plurality of liquid phase and gas phase lines of claim 35, wherein the internal  
2           liquid phase line is disposed inside the internal gas phase line.

\* \* \*